National Aeronautics and Space Administration

IT Talk

this issue

Cloud Computing Features and Benefits

The National Institute of Standards and Technology (NIST) describes cloud computing as "...a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction."

Scalability

Because computer and storage resources are provided through an abstracted interface, a cloud computing architecture allows the supported load on your web application to scale up dramatically, without the costs and delays of provisioning new infrastructure, re-engineering code, etc.

Cost Savings

Cloud computing systems can easily provide "pay-as-you-go" storage, processing and bandwidth services that fit your present needs. This means that you pay for only what you need, and you share economies of scale with the other cloud "tenants." Resource usage can be monitored, controlled and reported providing transparency for both the provider and consumer of the services.

NASA Cloud Computing Platform: Nebula

Source: Andrea M. Riso and Gretchen Curtis, Ames Research Center

Nebula is an open-source cloud computing platform that was developed to provide an improved alternative to building additional expensive data centers and to provide an easier way for NASA scientists and researchers to share large, complex data sets with external partners and the public.

Nebula is an excellent example of how NASA is championing ongoing partnerships with private industry and academia.

"When information is shared, everyone benefits," says NASA Chief Technology Officer for IT Chris C. Kemp.

"NASA Nebula is delivering a service that meets the computational requirements of NASA's scientific community," continues Ames Research Center Acting CIO James F. Williams.

Nebula helps NASA stakeholders bypass the often lengthy bureaucratic planning and procurement process for new IT infrastructure, ultimately saving NASA time and money.

There are many technological benefits exclusive to the Nebula cloud such as high-capacity computing and storage and network connectivity that is unmatched by commercial cloud providers (for more benefits see sidebar). The Ames Internet Exchange (AIX), which hosts the cloud, was formerly known as "Mae West," as one of the original nodes of the Internet.

Nebula's revolutionary container infrastructure features engineering for maximum flexibility, efficiency and scalability. Supporting NASA's missions, typically in collaboration with universities and other research organizations, Nebula's cloud computing approach to physical infrastructure must be as flexible as the services our partners host.

Nebula's modular infrastructure can be modified, upgraded, expanded and even physically relocated as needs evolve. Additionally, each container holds up to 30,000 CPU cores or 30 petabytes (one petabyte equals one million gigabytes), which is 50 percent more energy efficient than commercial clouds.

The Nebula launch was as a pilot project at Ames Research Center. NASA's goal is that Nebula will serve as a Federal testbed for cloud technology. The Office of Management and Budget (OMB) recognizes the value of pilots, and is encouraging Federal Agencies to investigate how to take advantage of cloud computing.

Nebula is one of the very first government clouds that meets all Federal security requirements, including FISMA. It is one of the few clouds physically located within a Federally-secured perimeter. Nebula will address key IT concerns involving security, portability and interoperability that all government Agencies will face in implementing cloud computing.

"When development is open, everyone benefits," says Kemp. ❑
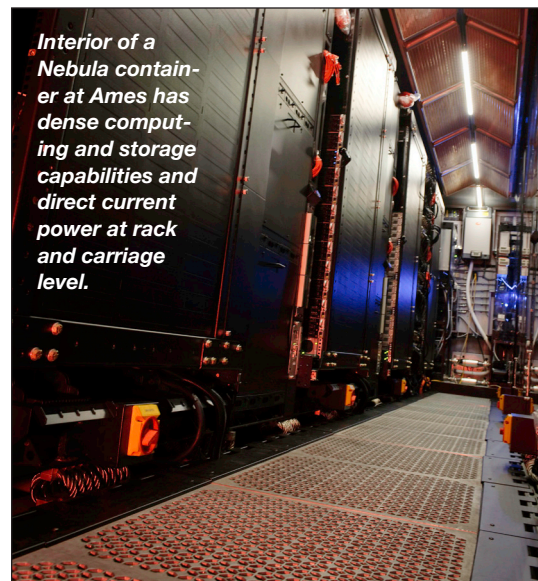
Interior of a Nebula container at Ames has dense computing and storage capabilities and direct current power at rack and carriage level.

Building Better Business at NASA with Enterprise Architecture

Source: Bob Hennan, JSC Chief Enterprise Architect and Catherine E. Williams, Public Relations Specialist

Deployment Speed

The integrated nature of hardware, software and resource provisioning allows rapid development and deployment of policy-compliant and secure web applications. Customers can unilaterally provision computing capabilities (virtual machine instances, storage, etc.) as needed automatically, without requiring human interaction. Also, a consistent set of frameworks, code repositories and web services means that your developers can concentrate on turning out quality applications without "reinventing the wheel" for low-level infrastructure requirements.

Resource Elasticity

Computing resources are aggregated to serve multiple consumers using a multi-tenant model, with different physical and virtual resources dynamically assigned and reassigned according to demand. This means that your web applications are supported by the full strength of the cloud's resources and will remain available during demand spikes.

Integrated Reporting and Policy Compliance

A cloud computing architecture provides a large organization with a single platform for reporting and policy compliance purposes. Managers can obtain detailed reports on resource use for all of their organizational elements, and can set boundaries within the cloud service levels to accomplish IT policy objectives while still delegating the day-to-day control of content and application development. ❑

While Johnson Space Center (JSC) is in the business of navigating unknown territories (especially in the cosmos), its Enterprise Architecture (EA) Program is one of the biggest transformations in the Center's history. JSC's efforts are part of a broader EA initiative at NASA.

In October 2009 NASA CIO Linda Y. Cureton specifically called out EA in announcing her intention to make the NASA IT orgnaization the very best in government.

"Strengthening our Enterprise Architecture is one of my top priorities," said Cureton.

NASA's EA Program Plan forms the planning and investment framework for aligning IT with the NASA mission and mission support needs in a structured, prioritized and integrated fashion.

The NASA Chief Enterprise Architect executes the NASA EA Program Plan in collaboration with Center Enterprise Architects to ensure planning, prioritization and alignment of investments that enable mission and mission support objectives and results.

"It's really about business transformation (and) everything you do aligning with the strategic goals of the business," said JSC Chief Enterprise Architect Bob Hennan. "We're in the business of space, so we ensure that everything we do, all the money we spend, all the components we buy, match the strategic goals of the agency."

So how does EA do this? After capturing the as-is and to-be organizing logic for processes and IT infrastructure, architects produce "blueprints" to define the current and desired operating environment, along with a sequencing plan.

"You model what you have for an architecture now. You decide where you really want to be, what your goals are, and you create a transition plan to get you from where you are to where you want to be," said Ric Slater, Project Management and Technical Integration Office Chief for the Information Resources Directorate. "The bottom line is you're looking at the business aspects of how it works."

The JSC EA Program is committed to helping with the center's evolution. JSC recently certified 25 new Enterprise Architects in a three-month class. The certification program was a collaborative, centerwide endeavor that combined participants from several organizations, along with contractors, culminating in a practicum presented to center and NASA Headquarters management.

The duties of the Enterprise Architects will include performing IT project architecture assessments and service reviews throughout the center.

Architects will strive to add value by ensuring alignment with the center and Agency architectures and by helping to establish a strong business case for all major investments. They will emphasize reuse, interoperability and the elimination of redundancy to improve business performance and productivity.

"One of the big purposes of this is system business agility," Hennan said. "Right now we need to be agile, because we're getting ready to change gears drastically with the Shuttle Program ending and now with Constellation ending. We're going to be starting a lot of new programs."

EA will be a major player as the center acclimates to different exploration goals.

"Knowing what you have now, where all your services are and the capabilities you have is real important, so we can quickly align those with the new programs and save the center, knowledge and resources we have here," Hennan said. "It's a real critical time, and Enterprise Architecture will play a big part in that transition."

The JSC EA Program operates under the authority of the Chief Information Officer at both the center and agency levels. While Enterprise Architecture works to provide quick solutions, it is no silver bullet—it requires hard work from dedicated teams at all levels. ❑

JPL Cloud Computing

By Tom Soderstrom, IT CTO, Jet Propulsion Laboratory, California Institute of Technology

JPL's Office of the CIO hosted a laboratory-wide Cloud Computing Day on May 12. The event, which drew a large audience on site and via JPL-TV, is part of a series of cloud innovation, exploration and educational events planned for 2010. The event was led by the 70-member JPL Cloud Working Group, whose members include representatives from JPL's OCIO, various JPL projects and line organizations, and industry partners.

ITIL: Enabling NASA's Best Practices in IT Service Management and Delivery

Source: Andrea M. Riso, Ames Research Center

The Information Technology Infrastructure Library (ITIL®) is an industry framework of governance and best practices, with orientation specific to IT service, development, finance and operations. ITIL is fostering NASA's alignment with recognition that information is the most important strategic resource any organization has to manage.

NASA's Chief Information Officer Linda Cureton continues to strategically evolve the way NASA views and implements our IT service delivery Agency-wide, innovating the way we conduct IT business, championing positive changes through adoption of the ITIL version 3 framework.

"Adapting these ITIL processes that have been refined and vetted thousands of times supports our goal of being the best at IT, enabling our delivery of outstanding IT services for our world- class scientists and engineers here at NASA," explains Cureton.

The ITIL framework has quickly become NASA's springboard for improving service delivery, mitigating disruptions, increasing productivity and enabling achievement of IT business objectives. Additionally, ITIL addresses new guidance and reporting requirements from the Office of Management and Budget (OMB).

Government and private industry leaders regard ITIL as the best and most cohesive approach to IT service management in existence. Spearheading our ITIL initiative on behalf of NASA's OCIO is NASA's Service Integration Manager Cliff Ward. This new framework is moving NASA away from the current federated management model to an industry-recognized Service Management and Service Delivery model.

"Our implementation of the ITIL v3 framework will enable us to increase our effectiveness in both management and delivery of IT services across our Agency,"

said Ward. "Our collaborative approach to consolidation and development of the 'NASA-ized' ITIL processes and procedures will result in our achieving 'The Best of the Best IT.'"

Significant sections of the ITIL framework and certification process include:

- Service Strategy.

- Service Design, with guidance on designing IT services along with their governing IT practices, policies and processes.

- Service Transition, for the development of capabilities in transitioning new and changing services into operations.

- Service Operation.

- Continual Service Improvement, addressing highest potential value for customers through better design, introduction and operation of services, linking improvement efforts with service strategy, design, transition and operation.

The IT Infrastructure Library (ITIL) defines service as, "…a means of delivering value to customers by facilitating outcomes customers want to achieve without the ownership of specific costs and risks." ITIL defines Service Management as, "…a set of specialized organizational capabilities for providing value to customers in the form of services."

There are more than a dozen ITIL training modules available on NASA's training system, SATERN *http://satern.nasa.gov*. ❏

Attendees saw live demonstrations of several JPL mission prototype applications running in the clouds; explored cloud security, network and business issues; heard about the real metrics and experiences of multiple cloud vendors and cloud types; debated JPL's strategy of keeping cloud computing real for the missions through early exploration of multiple clouds. Attendees were invited to submit their applications via an online tool to the Cloud Application Suitability Model (CASM), which helps to determine for which cloud an application is most suited. The audience was also given access

to an online cloud collaboration website and invited to participate in continued development of the newly created Cloud Readiness Level (CRL) framework.

The audience of JPLers and industry partners unanimously agreed that JPL is on the right track toward effective usage of clouds "by keeping it real" and that cloud computing can have measurable benefits for JPL and NASA. With the affirmative conclusion of this event, cloud computing now transitions from a Prototype to a pilot activity at JPL. ❏

Adrian Gardner
Goddard's New CIO

Adrian Gardner is Goddard Space Flight Center's new Chief Information Officer (CIO) and Director of the Information Technology and Communications Directorate. Gardner came on-board at Goddard in early February from the National Weather Service where he had served as CIO since January 2007. Prior to his time at the Weather Service, Gardner was with the Department of Energy as the Deputy CIO for Cyber Security from September 2005 to September 2006 and the Deputy CIO for IT Reform from October 2006 to January 2007. He is currently the Chair of the POC Working Group for Data.gov.

Gardner is a Doctoral candidate at the University of Southern California, School of Public Policy and Planning where he holds a Masters degree in Public Administration. He also holds a Master of Science degree in Environmental Studies from Hood College and a Bachelor of Science in Biological Science and Ecology from the esteemed Tuskegee Institute. An Air Force veteran, Gardner received the Air Force Achievement Medal in 1987.

Gardner serves on the Board of the District of Columbia Urban League and is a volunteer and mentor to several academic and youth programs. ❏

Antunes Receives Federal 100 Award

GSFC Web Manager Emma Antunes has received the Federal 100 Award, which honors individuals whose ideas and accomplishments have the greatest impact in shaping missions, solutions and results achieved by the government information technology community.

Antunes spearheaded the development of Goddard's Spacebook, an internal Facebook-like application that enables NASA scientists, engineers and others to collaborate on projects. Her efforts in social networking have been held up as a model for government organizations. ❑

James Williams Named Computerworld Honors Laureate

James F. Williams, Acting Chief Information Officer of NASA Ames Research Center in Silicon Valley, is a Laureate of the 2010 Computerworld Honors Program in recognition of his visionary excellence in organizational innovation and strategically managing information technology through the creation and implementation of Ames's Service Integration Management project.

The Service Integration Management project aligns Ames IT Enterprise Architecture with NASA Agency strategic initiatives, streamlining the Ames Research Center IT mission with business processes, eliminating organizational boundaries.

Service Integration Management features innovative, reliable IT solutions through enhancement of costing practices and resource management, thus removing the administrative burden of capturing requirements from each management division in the organization. They can then focus on developing, testing and delivering optimum IT services as NASA's "Innovation Engine for Information Technology."

Williams' goals with Service Integration Management include putting the customer first, aligning Ames IT and management practices with NASA's requirements and strategic initiatives and consolidating missions, business processes and information across organizational boundaries. Williams and Ames Research Center, through Service Integration Management, has gained a reputation as an innovator of IT solutions for NASA and other Federal Agencies.

NASA Ames Service Integration Management project reduces complexity, standardizing the development and delivery of IT Ames Research Center has been able to develop and deliver innovative new IT solutions faster and more cost-efficiently than before, all while ensuring alignment with the vision for the NASA Enterprise Architecture. An early example of this is the Nebula cloud-computing (see cover story). Ames is also delivering critical support to NASA's Security Operations Center (SOC). Ames customers within NASA and throughout the Federal government are reaping the benefits of Williams' integrated approach to customer service.

Williams, a native of Pennsylvania, is a nuclear and materials engineer. The 22nd Annual Laureates Medal Ceremony & Gala Awards Evening will take place in June in Washington, D.C. ❑

Making IT Stellar at NASA

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